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(54) Title: EASILY EXPANDABLE, NONTRAPPING, FLEXIBLE PAPER, MICROWAVE PACKAGE			
(57) Abstract			
<p>A flexible paper popcorn package in the form of an easily expandable, nontrapping bag (18) is disclosed including a bottom wall (20) and a top wall (22) interconnected together adjacent their circular outer peripheries (20a, 22a) by first and second interconnection portions (26a, 26b). In one preferred form, the top wall (22) is formed by first and second wall portions (22b, 22c) interconnected together by a peelable closure seal (28). In another preferred form, the top wall (22) is formed from a first portion (22d) having an access opening closed by a closure portion (22e) interconnected by a seal (40) including the peelable closure seal portion (40a) to the first portion (22d). In still another preferred form, the bottom and top walls (20, 22) are interconnected together by their interconnection to gusseted side panels (50, 52), with the peelable closure seal being formed in the interconnection between the bottom and top walls (20, 22). The bottom and top walls (20, 22) expand into an opposing double domed shape as the popcorn kernels are being popped in the microwave oven. This domed shape of the bottom wall (22) keeps the unpopped popcorn huddled closer together and enhances the bag (18) to rock to maximize gravimetric separation. The bag (18) provides a serving bowl function when the peelable closure seal has been opened providing access to the interior of the bag (18) and specifically to the popped popcorn located therein.</p>			

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1 EASILY EXPANDABLE, NONTRAPPING, FLEXIBLE PAPER,
MICROWAVE PACKAGE

BACKGROUND

5 The present invention relates generally to packages
for use in microwave ovens, pertains particularly to an
easily expandable, nontrapping, flexible, microwave
package formed of non-extendable material for the popping
or puffing of grains and especially popcorn kernels, and
pertains more particularly to a microwave package
10 providing serving bowl and/or easy open features.

To conserve space during shipping and storage,
microwave popcorn packages are often folded flat. During
popping by use of microwave energy, the popcorn package
expands, with the expansion due to the internal pressure
15 of the steam produced by the popping of the popcorn
kernels, the pressure of the popped kernels themselves, as
well as other factors. An important feature for
maximizing the volume of the popped kernels is the ability
of the microwave popcorn package to easily expand.
20 Another important factor for maximizing the volume of the
popped kernels is that the number of kernels which are
actually popped be maximized by insuring that the unpopped
kernels are located together on the susceptor with
sufficient dwell time to receive sufficient heat energy to
25 result in popping. The shape of the bag plays an important
role in the ability of the bag to expand as well as the
ability of unpopped kernels to come in contact with each
other and the susceptor before and during popping.

One form of conventional popcorn packages is a bag
30 having a rectangular top, a rectangular bottom and pleated
sides and with at least one end being sealed together by
attaching the top and bottom together such as but not
limited to by folding the end of the bag over onto itself.
It is a common problem for unpopped kernels to be
35 propelled in the popping process into folds and crevices
in the bag and especially those created by the pleats in
the sides adjacent to the end(s) of the bag. Such kernels

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1 may tend to be captured in such folds and crevices so that
they are unable to travel towards the susceptor and are
less likely to be popped during microwave cooking.

Further, conventional rectangular popcorn bags tend to
5 get hung up in the corners of the microwave ovens. This
is undesirable for microwave ovens including turntables as
the bag will no longer rotate inside of the microwave
cavity but is locked in position by the corner. However,
even for microwave ovens which are not equipped with
10 turntables, the expansion of the bag and/or the vibration
of the bag caused by the popping of the popcorn does not
result in moving the bag to the center of the microwave
cavity when the bag gets hung up in a corner of the
microwave cavity. This is undesirable as cooler spots
15 typically exist in the corners of the microwave cavity and
as lack of movement of the bag subjects certain points in
the bag to see specific hot spots or electronic nulls.

Thus, a need continues to exist for an improved
flexible paper popcorn package which is easily expandable
20 by the dynamics involved in popping the kernels, which is
less likely to capture unpopped kernels during the
expansion of the package while subjected to microwave
energy, and which provides the most consistent and uniform
distribution of microwave energy in maximizing the number
25 and volume of popped popcorn. In further aspects of the
present invention, the popcorn package which is utilized
to pop the popcorn kernels has the ability to be utilized
as the serving bowl during consumption of the popped
kernels. In still other aspects of the present invention,
30 the expanded popcorn package can be easily opened by the
consumer with minimal instructions.

Surprisingly, the above need and other objectives
can be satisfied by providing, in the preferred form,
an expandable microwave package in the form of a bag
35 formed by top and bottom walls of flexible, non-extendable
material interconnected together adjacent to their

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1 round-like shaped outer peripheries so that the top and
bottom walls expand into an opposing double domed shape
when the popcorn kernels are popped in the microwave oven.

In a most preferred form, the top wall includes a
5 peelable closure seal which vents during microwave cooking
and which can be physically separated after microwave
cooking for ease of access to the popped popcorn and so
that the bag clearly functions as a serving bowl. In most
preferred aspects, the peelable closure seal is formed in
10 the interconnection between first and second wall
portions, and in a preferred form the bag further includes
first and second extensions extending outwardly from the
first and second wall portions for grasping to separate
the first and second wall portions.

15 In another most preferred form, the top wall is
fabricated from multiple layers and includes a first
annular portion having an access opening and a closure
portion of a size greater than the access opening and
interconnected to the first portion by a seal. In most
20 preferred aspects, the seal includes a peelable closure
portion which fails during microwave cooking, and an
extension is formed on the outer periphery of the closure
portion for grasping when removing the closure portion.

In still another preferred form, the peelable closure
25 seal is formed in the interconnection between the bottom
and top walls. In most preferred aspects, extensions are
formed on the outer peripheries of the top and bottom
walls adjacent the peelable closure seal and outward of
the interconnection, with the consumer grasping and
30 pulling the extensions to open the bag for removing the
popped popcorn from the interior of the bag.

In other preferred aspects of the present invention,
the bottom and top walls are interconnected together by
their interconnection to first and second gusseted side
35 panels, with the outer periphery of the bottom wall being
interconnected to the outer peripheries of the first panel
portions of the first and second gusseted side panels and

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- 1 the outer periphery of the top wall being interconnected
to the outer peripheries of the second panel portions of
the first and second gusseted side panels, with the outer
peripheries of the panel portions corresponding to the
5 outer peripheries of the bottom and top walls.

In still other preferred aspects of the present
invention, the bag formed by the interconnection of top
and bottom walls having round-like shaped outer
peripheries is folded about first and second, parallel,
10 fold lines located on opposite sides of a periphery
interconnection portion, then folded about a third fold
line extending perpendicularly between the first and
second fold lines at which time the popcorn kernels are
introduced through the periphery interconnection portion
15 which is then sealed, and then folded about a fourth fold
line extending parallel to the third fold line, with the
folded bag having a conventional, rectangular shape for
secondary packaging.

The present invention will become clearer in light of
20 the following detailed description of illustrative
embodiments of this invention described in connection with
the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

The illustrative embodiments may best be described by
25 reference to the accompanying drawings where:

Figure 1 shows a perspective view of a package
fabricated in accordance with the preferred teachings of
the present invention in generally an expanded condition.

Figure 2 shows a top plan view of the package of
30 Figure 1 in an unfilled, flat condition, with portions
broken away.

Figure 3 shows a perspective view of the package of
Figure 1 in an unfilled, partially folded condition, with
portions broken away.

35 Figure 4 shows a perspective view of the package of
Figure 1 in an unfilled, partially folded condition.

Figure 5 shows a perspective view of the package of

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1 Figure 1 in an unfilled, partially folded condition and with the peripheries in the upper edge separated for the introduction of popcorn kernels and the like, with portions broken away.

5 Figure 6 shows a top plan view of the package of Figure 1 in a filled, partially folded condition, with portions broken away.

Figure 7 shows a perspective view of the package of Figure 1 in a filled, folded or collapsed condition.

10 Figure 8 shows a cross sectional view of the package of Figure 1 according to section line 8-8 of Figure 1, with the popped popcorn being removed for ease of illustration.

Figure 9 shows a side view of the package of Figure 1 in an opened condition.

Figure 10 shows a top plan view of a package in an unfilled, flat condition and fabricated in accordance with the preferred teachings of the present invention, with portions broken away.

20 Figure 11 shows a perspective view of the package of Figure 10 in a filled, expanded, and partially opened condition.

Figure 12 shows a perspective view of a package fabricated in accordance with the preferred teachings of the present invention and in an expanded condition showing a preferred method of opening.

Figure 13 shows a top plan view of a package in an unfilled, flat condition and fabricated in accordance with the preferred teachings of the present invention, with portions broken away.

Figure 14 shows a diagrammatic, perspective view of the package of Figure 13 in an expanded condition showing a preferred method of opening.

Figure 15 shows a diagrammatic, perspective view of the package of Figure 13 in an expanded condition to illustrate its enhanced serving bowl function.

Figure 16 shows an exploded perspective view of the

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1 package of Figure 13 diagrammatically illustrating one
method of fabrication according to the teachings of the
present invention.

Figure 17 shows a top plan view of a package in an
5 unfilled, flat condition and fabricated in accordance with
the preferred teachings of the present invention, with
portions broken away.

All figures are drawn for ease of explanation of the
basic teachings of the present invention only; the
10 extensions of the Figures with respect to number, position,
relationship, and dimensions of the parts to form the
preferred embodiments will be explained or will be within
the skill of the art after the following teachings of the
present invention have been read and understood. Further,
15 the exact dimensions and dimensional proportions to
conform to specific force, weight, strength, and similar
requirements will likewise be within the skill of the art
after the following teachings of the present invention
have been read and understood.

20 Where used in the various figures of the drawings,
the same numerals designate the same or similar parts.
Furthermore, when the terms "top", "bottom", "first",
"second", "side", "end", "inner", "outer", "inside",
"outside", and similar terms are used herein, it should
25 be understood that these terms have reference only to the
structure shown in the drawings as it would appear to a
person viewing the drawings and are utilized only to
facilitate describing the preferred embodiments.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

30 A package for use in microwave ovens according to the
preferred teachings of the present invention is shown as
an expandable, flexible bag in the drawings and generally
designated 18. It will facilitate the ensuing description
to consider bag 18 in the horizontal position when placed
35 in the microwave oven. Therefore, bag 18 includes a
bottom wall 20 and a top wall 22 of a shape and size
generally corresponding to bottom wall 20. Each wall 20

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1 and 22 is formed by a sheet of flexible but non-extendable material such as papers including but not limited to base coated paper or similar cellulose structures, polymers including but not limited to polyethylene terephthalate, 5 polyester and nylon, or other like microwaveable materials. The material forming walls 20 and 22 can be opaque, translucent, clear, or combinations thereof. Each wall 20 and 22 includes an outer periphery 20a and 22a, respectively, which is generally equidistant from the 10 center 24 of the shape of walls 20 and 22 and in the most preferred form is generally circular in shape. However, peripheries 20a and 22a could be in other substantially round or round-like shapes which are arcuate and/or include peripheral edge interconnections which do not have 15 a tendency of getting hung up in the corners of the microwave oven such as symmetrical shapes including ovals, pentagons, hexagons, heptagons, octagons, etc. and such as non-symmetrical shapes such as a generally egg shape.

To define a hollow interior, walls 20 and 22 are 20 interconnected together adjacent to peripheries 20a and 22a by a seal which maintains the integrity of bag 18 during manufacture, handling, transportation and retailing of bag 18 and its contents and until microwave cooking. In the most preferred form, the interconnection between 25 walls 20 and 22 is sufficient so as to seal adequately the vapor created within the bag 18 during the heating thereof in the microwave oven as well as to prevent undesired opening during the consumption of the popped kernels. In the most preferred form, a suitable annular adhesive strip 30 26 is added to the inside surface of one or both of walls 20 and 22 to secure walls 20 and 22 together adjacent peripheries 20a and 22a after the application of heat and/or pressure. Additionally, when interconnected by adhesive strip 26, walls 20 and 22 can be positioned so 35 that they are generally planar and continuously abut without bulges or folds in the most preferred form.

In the most preferred form, bag 18 includes a

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1 susceptor patch 30 that extends over a portion of bottom
wall 20 spaced from periphery 20a and in the most
preferred form generally centered about center 24.
Susceptor patch 30 can be formed in any suitable manner
5 known in the art such as a metalized plastic film adhered
to bottom wall 20 as diagrammatically shown in Figure 8
(with the thickness of susceptor patch 30 being
exaggerated for ease of illustration) or adhered between
separate layers forming bottom wall 20, as a paper backed
10 susceptor, or as a coating applied or printed to bottom
wall 20. Further, although susceptor patch 30 is shown as
overlying bottom wall 20 and thus located inside of bag
18, susceptor patch 30 can be located outside of bag 18
with bottom wall 20 overlying susceptor patch 30.
15 Further, placement of susceptor patch 30 can occur at the
material converter or on the manufacturing lines.

In the preferred form shown in Figures 1, 2, 8 and 9,
top wall 22 is formed from first and second wall portions
22b and 22c which are interconnected together by a fin
20 seal 28. In the preferred form, portions 22b and 22c are
generally semicircular in shape and fin seal 28 extends
between opposite points on periphery 22a and specifically
along a diameter of the circular shape of periphery 22a.
Fin seal 28 provides a peelable closure which partially fails
25 during microwave cooking. Specifically, this partial
failure of fin seal 28 allows trapped steam to vent from
bag 18 as well as allows the consumer to continue to peel
seal 28 to open bag 18 after microwave cooking to provide
access to the popped popcorn kernels in the hollow
30 interior of bag 18 for consumption.

Bag 18 can be manufactured according to the preferred
teachings of the present invention in the following
manner. Specifically, walls 20 and 22 are positioned with
their inside surfaces abutting together and with
35 peripheries 20a and 22a aligned. A first, interconnection
portion 26a of strip 26 is suitably activated to
interconnect walls 20 and 22 together aside from a second,

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1 interconnection portion 26b. While first, interconnection
portion 26a extends a substantial portion of peripheries
20a and 22a, second, interconnection portion 26b in the
preferred form has a radial extent generally equal to one
5 half of the diameter of the shape of peripheries 20a and
22a.

At that time, the partially formed bag 18 can be
folded along parallel fold lines 32a and 32b which are
radially spaced generally equal to one half of the
10 diameter of the shape of peripheries 20a and 22a and
extending from first and second points on opposite sides
of and generally coextensive with the ends of portion 26b.
In the preferred form, fold lines 32a and 32b are located
on opposite sides of the diameter of the shape of
15 peripheries 20a and 22a and equidistant therefrom. Thus,
bag 18 is divided into a central portion 34a and first and
second wings 34b and 34c which are folded to overlay
central portion 34a. Wings 34b and 34c have a radial
width generally equal to one fourth of the diameter of the
20 shape of peripheries 20a and 22a and generally equal to
one half of the radial width of central portion 34a.
Thus, wings 34b and 34c do not overlay each other when
folded to overlay central portion 34a. Bag 18 as folded
at this point includes first and second, parallel,
25 straight side edges defined by fold lines 32a and 32b and
upper and lower edges which are generally convex defined
by peripheries 20a and 22a intermediate fold lines 32a and
32b.

The partially formed bag 18 can then be folded about a
30 third fold line 36 extending generally perpendicularly
between the first and second straight side edges defined
by fold lines 32a and 32b and located about one third of
the diameter of the shape of peripheries 20a and 22a from
the lower edge. Thus, bag 18 includes a wing 36a which
35 includes the lower parts of portion 34a and wings 34b and
34c and which is folded to overlay wings 34b and 34c, with
portion 26b being opposite to wing 36a. Bag 18 as folded

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1 at this point includes first and second, parallel,
straight side edges defined by fold lines 32a and 32b, a
straight lower edge defined by fold line 36 extending
generally perpendicular to the side edges, and an upper
5 edge which is generally convex defined by peripheries 20a
and 22a intermediate fold lines 32a and 32b and including
portion 26b.

While in a folded condition and held with walls 20 and
22 being vertical with the upper edge located vertically
10 above the lower edge, peripheries 20a and 22a in the upper
edge are separated and a charge of popcorn kernels, fat or
oil, salt, flavorings, or the like are introduced into the
interior of bag 18. It should be appreciated that due to
the folded condition of bag 18, the charge is generally
15 prevented from passing beyond fold lines 32a, 32b and 36
and into wings 34b, 34c, and 36a but is retained adjacent
center 24 of bag 18.

After the charge has been introduced, portion 26b can
be suitably activated to interconnect walls 20 and 22
20 together. Thus, walls 20 and 22 are interconnected
together around the entire length of peripheries 20a and
22a. Additionally, strip 26 and seal 28 close bag 18 so
that the charge in the hollow interior of bag 18 is
completely sealed from the environment.

25 After portion 26b is sealed, bag 18 can again be
folded about a fourth fold line 38 extending generally
perpendicularly between the first and second straight side
edges defined by fold lines 32a and 32b and parallel to
fold line 36 and located about one third of the diameter
30 of the shape of peripheries 20a and 22a from the upper
edge. Fold line 38 is located adjacent to peripheries 20a
and 22a of wing 36a and is located above the charge in the
hollow interior of bag 18. Thus, bag 18 includes a wing
38a which includes the upper parts of portion 34a and
35 wings 34b and 34c and which is folded to overlay wing 36a.
It should be appreciated that due to the folded condition
of bag 18, the charge is also generally prevented from

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- 1 passing beyond fold line 38 and into wing 38a but is
retained adjacent center 24 of bag 18. Bag 18 as folded
at this point is generally rectangular shaped of a size
and shape of conventional folded, paper popcorn bags and
5 includes first and second parallel side edges defined by
fold lines 32a and 32b, and parallel lower and upper edges
defined by fold lines 36 and 38, respectively. In the
most preferred form, the folded, charged bag 18 is sealed
into a flexible overwrap for packaging and storage.
10 Conventionally, such overwrap is formed by clear or opaque
translucent plastic but could be formed by metalized film,
sputtered glass/ceramic or other barrier constructions.
It of course should be appreciated that typically such
overwrap is removed by the consumer just prior to
15 microwave cooking.

For the sake of completeness, it will be assumed that
the contents or charge of bag 18 are popcorn kernels or
any suitable grain such as rice, maize, barley, sorghum, or
the like for being popped or puffed when in the microwave
20 oven. Particularly, as with current bags, bag 18 is
placed in a microwave oven with bottom wall 20 resting
upon the bottom surface of the oven cavity and preferably
with bag 18 being partially or completely unfolded by the
consumer. When subjected to microwave energy, susceptor
25 patch 30 converts microwave energy into heat, with the
heat and remaining microwave energy causing the popping of
the kernels and the generation of water vapor/steam. The
water vapor and heated vapor pressure air cause wings 38a,
36a, 34b and 34c to unfold or to continue to unfold about
30 fold lines 38, 36, 32a and 32b, respectively, so that
walls 20 and 22 have a continuous shape. Each wall 20 and
22 expand into a bowl, hemispheric or parabolic curve
shape from their peripheries 20a and 22a with the inside
surfaces of bottom and top walls 20 and 22 being spaced,
35 expanding bag 18 and increasing the interior volume inside
of bag 18 for the popped kernels. It can then be
appreciated that due to its flexible nature, bag 18 will

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1 expand to an opposing, double dome shape. However, due to
the non-extendable nature of the material forming walls 20
and 22, the interconnection between walls 20 and 22
adjacent to peripheries 20a and 22a will tend to gather
5 and pucker as best seen in Figures 1, 8, and 9 as walls 20
and 22 change their shape from being generally planar to
being dome shaped. When bag 18 is formed of paper con-
ventionally utilized for popcorn packages without further
processing, the size, shape and direction of such puckers
10 will generally not be uniform around peripheries 20a and
22a and will tend to vary between different bags 18.

Bag 18 according to the preferred teachings of the
present invention is advantageous over prior microwave
popcorn bags. Particularly, when first placed in the
15 microwave oven, the pleats of the sides of conventional
popcorn packages extend at least partially over the charge
of popcorn kernels to be popped. Thus, the initial
microwave energy has to penetrate several layers of
material which forms the bag. As the material is not
20 completely transparent to microwave energy, part of the
microwave energy is absorbed by the material which then is
generally not available to the charge of popcorn kernels.
However, only a single layer of material forming walls 20
and 22 of bag 18 extends over the charge of popcorn
25 kernels generally from the start of microwave cooking.
Thus, it is not necessary for the initial microwave energy
to penetrate several layers of material before reaching
the charge and therefore the microwave energy is generally
available quicker and in greater amounts to the charge.

30 Further, the bowl or parabolic curve shape of the
inflated bag 18 keeps the unpopped kernels huddled closer
together even in more than a single layer at the bottom of
the shaped wall 20 and in closer contact with susceptor
patch 30 in the preferred form. This close nesting or
35 clustering of the unpopped kernels is a very efficient and
attractive load for incoming microwaves. Specifically,
the cluster load radiates less heat, and temperature

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1 increases at a quicker rate. The cluster load has a
higher loss tangent (more lossy) than a dispersed load.

Further, as the bowl or parabolic curve shape has a
relatively low surface area to volume relationship similar
5 to that of a sphere, walls 20 and 22 include less material
which competes for microwave energy with the kernels.

Additionally, when the kernels pop, the popping
kernels may spray unpopped kernels from the nesting.
However, bag 18 according to the teachings of the present
10 invention allows the unpopped kernels to settle to the
bottom of the shaped wall 20 much like a covered Japanese
Wok pan does. Further, the expansion of bag 18 according
to the teachings of the present invention generally does
not create folds or crevices which capture unpopped
15 kernels and prevent their movement towards the cluster of
any other unpopped kernels and/or susceptor patch 30.

Furthermore, the force of the popping kernels hitting
against walls 20 and 22 jostles or vibrates bag 18 which
enables the unpopped kernels to fall through the popped
20 kernels and reengage wall 20 and to slide on wall 20 to
the bottom thereof. Specifically, the vibration of bag 18
creates agitation of the popped and unpopped kernels in
bag 18 resulting in gravimetric separation of the unpopped
kernels to the bottom of the popped kernels due to their
25 greater density. In this regard, the bowl or parabolic
curve shape of bottom wall 20 enhances the ability of bag
18 to rock in any direction from the force of the popping
kernels hitting against walls 20 and 22 to maximize the
gravimetric separation of the unpopped kernels to the
30 bottom of the popped kernels.

Still further, the bowl or parabolic curve shape of
inflated bag 18 greatly improves popping performance in
the diverse microwave ovens available to consumers. As
much as a 40% improvement in popping performance was
35 experienced with bag 18 according to the preferred
teachings of the present invention compared to paper
popcorn bags of conventional shapes under variations

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1 experienced in normal use. These variations include but
are not limited to microwave ovens of differing wattage,
volume, and/or efficiency, fluctuations in electric
current, different magnetrons of the same or different
5 manufacture, different wave guides, and the like.

If susceptor patch 30 is provided as in the preferred
form, there is no need to include susceptor patch 30 at
locations where unpopped kernels are not. Thus, susceptor
patch 30 is located only at the bottom of the shaped wall
1020 and can be of a minimized size due to the bowl or
parabolic curve shape of wall 20. In this regard, and
especially due to the bowl or parabolic curve shape of
wall 20, susceptor patch 30 may be shaped to minimize
material utilized such as being circular in shape or being
15 in non-continuous areas. In the most preferred form,
patch 30 is located within fold lines 32a, 32b, 36, and
38.

Also, the round-like shapes of peripheries 20a and 22a
of walls 20 and 22 and thus of bag 18 distribute the
20 popped kernels into a wider distribution field. Being
spread in the microwave oven cavity, the popped kernels
become less attractive and are fairly transparent to the
microwave energy. In addition to the less dense load
configuration, the popped kernels are able to dissipate
25 the heat better and therefore not allowing the popped
kernels to continue to overcook, caramelize, burn, char, or
dry out any further. This results in bag 18 that is less
prone to scorching the popped product.

Further, the round-like shapes of peripheries 20a and
30 22a of walls 20 and 22 and thus of bag 18 work very well
in all microwave ovens equipped with or without
turntables. No matter where the consumer places bag 18 in
the microwave oven, bag 18 will always inflate and
position itself near the center of the microwave oven.
35 The round-like profile does not allow bag 18 to get hung
up in the corners of the microwave ovens where typically
cooler spots exist. The round-like shape always continues

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1 to rotate on the turntable ovens. This centered and/or
rotating positioning of bag 18 allows bag 18 to move so
that it is less likely for any particular point in bag 18
to see specific hot spots or electronic nulls and allows
5 the opportunity for the most consistent and uniform
distribution of microwave cooking.

It should be noted that fin seal 28 of the most
preferred form partially releases to vent steam from bag
18 during microwave cooking. Additionally, after removal
10 from the microwave oven, the consumer can grasp portions
22b and 22c on opposite sides of seal 28 and pull them
apart to further release fin seal 28 and if desired the
interconnection between peripheries 20a and 22a adjacent
to fin seal 28 in a manner as shown in Figure 9 to allow
15 access to the hollow interior of bag 18 and specifically
to the popped popcorn located therein. It can then be
appreciated that bag 18 having top wall 22 including the
peelable closure clearly functions as a serving bowl.

In alternate forms of bag 18, the serving bowl
20 function can be accomplished by fabricating top wall 22
from multiple layers of material. In a preferred form as
shown in Figures 10 and 11, top wall 22 is formed from
first and second wall portions 22d and 22e which are
interconnected by a seal 40. In the preferred form shown,
25 portion 22d is generally annular in shape including outer
periphery 22a and an inner periphery 22f defining an
access opening which is circular in the most preferred
form. The size of the access opening should be sufficient
to extend a hand into the interior of bag and grasp popped
30 popcorn therefrom. Portion 22e is generally circular in
shape and includes an outer periphery 22g which is of a
shape generally corresponding to periphery 22f but of a
size slightly greater than periphery 22f. In the most
preferred form, outer periphery 22g includes an extension
35 42 beyond the otherwise circular shape, with extension 42
being of a size located within outer periphery 22a of top
wall 22 in the preferred form shown. Seal 40 is annular

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1 in shape having an inner diameter corresponding to inner
periphery 22f of portion 22d and an outer diameter
corresponding to outer periphery 22g of portion 22e.
Extension 42 in the most preferred form is not adhered and
5 specifically in the form shown is not adhered to portion
22d or any other portions of top wall 22 or bag 18.
Additionally, in the most preferred form, seal 40 includes
a first, peelable closure portion 40a which has an arcuate
extent generally equal to the circumferential extent of
10 extension 42 and a second, interconnection portion 40b
extending the remaining circumferential extent of seal 40.
In particular, portion 40a fails during microwave cooking
to provide venting and to allow ease of separation when
desired to open bag 18 whereas portion 40b as well as
15 adhesive strip 26 remain secured during microwave cooking.

Bag 18 of Figures 10 and 11 can be manufactured
according to the preferred teachings of the present
invention in the following manner. Specifically, portion
22e is positioned to overlies portion 22d, and portions 22d
20 and 22e are positioned to overlies wall 20. Interconnection
portion 26a of strip 26 and seal 40 are suitably activated
to interconnect portions 22d and 22e to form wall 22 and
to interconnect walls 20 and 22. After activation of
first, interconnection portion 26a and seal 40, bag 18
25 according to the teachings of the present invention can be
folded, filled, sealed, folded, and overwrapped in
generally the manner as set forth in Figures 3-7.

Bag 18 of Figures 10 and 11 will expand to an
opposing, double dome shape in a similar manner as bag 18
30 of Figures 1, 8, and 9. Thus, the advantages of the bowl,
hemisphere, or parabolic curve shape are also obtained by
inflated bag 18 of Figures 10 and 11 according to the
preferred teachings of the present invention.

It should be noted that portion 40a of seal 40
35 partially releases during microwave cooking to vent steam
from bag 18 during microwave cooking whereas adhesive
strip 26 and portion 40b remain secured. After removal

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1 from the microwave oven, the consumer can grasp extension
42 between the consumer's thumb and one or more fingers
of one hand and pull upwardly and diametrically, with
extension 42 being free of adhesive securement resulting
5 in advantages in its ability to be grasped. If necessary,
bag 18 can be held by the consumer's other hand such as by
grasping the rim defined by adhesive strip 26 between
walls 20 and 22 at the circumferential position
corresponding to extension 42. Due to the peelable nature
10 of portion 40a, initial movement of extension 42 will
release any remaining securement of portion 40a so that
the part of portion 22e overlying portion 22d and portion
40a will separate from portion 22d without tearing.
However, with continued movement of extension 42 and due
15 to the greater securement of portion 40b in the most
preferred form, portion 22d will tend to tear following
the outer periphery of seal 40 in a manner as best seen in
Figure 11 rather than having portion 22e separate from
portion 22d. In the most preferred form, portion 22e (and
20 any parts of portion 22d corresponding to seal 40 and
which are torn off) is completely removed from the
remaining portions of bag 18. After removal of portion
22e, portion 22d acts like an annular rim in holding the
remaining portions of bag 18 in a serving bowl function.
25 It should be appreciated that although the serving
bowl function is accomplished by the peelable closure
formed by fin seal 28 and by the multipaper fabrication
provided by portions 22d and 22e in most preferred forms,
the serving bowl function can be formed by other manners
30 including by using perforations, tear strips, cut scoring,
thinning sealant, and controlled delamination according to
the teachings of the present invention. Likewise,
although providing the peelable closure in top wall 22 is
believed to be advantageous at least because of the
35 serving bowl function, the peelable closure which fails
during microwave cooking to provide venting can be formed
at other locations such as in portion 26b. In particular,

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1 after popping the popcorn and while pinching bottom and
top walls 20 and 22 between the fingers in the consumer's
hands, bottom and top walls 20 and 22 can be pulled apart
to separate any remaining securement of portion 26b and to
5 separate portion 26a in an amount as desired such as to a
circumferential extent allowing the popped popcorn to be
poured therefrom or completely removing top wall 22 from
bottom wall 20 so that bottom wall 20 performs a serving
bowl function.

10 Although walls 20 and 22 are interconnected directly
together adjacent to peripheries 20a and 22a in the most
preferred form shown in Figures 1-3 and 8-12, walls 20 and
22 according to the teachings of the present invention
could be interconnected together by their interconnection
15 to a side wall which accordions during the expansion of
bag 18 to increase the size of the hollow interior of bag
18 in its expanded condition. In an alternate embodiment
according to the teachings of the present invention, walls
20 and 22 of bag 18 could be interconnected together by
20 their interconnection to gussetted side panels 50 and 52
added on opposite sides of walls 20 and 22 such as in a
manner shown in Figures 13-16. In the form shown,
gussetted side panels 50 and 52 each comprises first and
second side panel portions 50a and 50b and 52a and 52b
25 joined along fold lines 50c and 52c, respectively. In the
preferred form shown, fold lines 50c and 52c are linearly
straight. Portions 50a, 50b, 52a, and 52b of panels 50
and 52 include peripheries 50ad, 50bd, 52ad, and 52bd
which are arcuate in shape corresponding to the
30 peripheries 20a and 22a of walls 20 and 22. Peripheries
50ad and 52ad are interconnected to periphery 20a and
peripheries 50bd and 52bd are interconnected to periphery
22a such as by adhesive strip 26, with fold lines 50c and
52c being in a spaced, parallel relation.

35 In the preferred form shown, the maximum width of
portions 50a, 50b, 52a, and 52b between peripheral edges
50ad, 50bd, 52ad, and 52bd generally perpendicular to fold

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1 lines 50c and 52c is less than one half of the maximum
diametric size of peripheries 20a and 20b generally
perpendicular to fold lines 50c and 52c. In fact, as best
seen in Figure 13, the widths of gusseted side panels 50
5 and 52 are substantially less than the widths of the pleats
of conventional popcorn package and specifically in a
manner so as to minimize or eliminate extending over
susceptor patch 30 and/or the charge of popcorn kernels to
be popped. Thus, it is not necessary for the initial
10 microwave energy to penetrate several layers of material
before reaching the charge and therefore the microwave
energy is generally available quicker and in greater
amounts to the charge. However, portions 50a, 50b, 52a,
and 52b can have widths of a size relative to the
15 diametric size of walls 20 and 22 which is different than
shown according to the teachings of the present invention.

Bag 18 of Figures 13-16 can be manufactured according
to the preferred teachings of the present invention in the
following manner. Specifically, side panels 50 and 52 are
20 folded about fold lines 50c and 50d such that the outside
surfaces of portions 50a and 52a overlies the outside
surfaces of portions 50b and 52b. Walls 20 and 22 are
positioned with their inside surfaces abutting together
intermediate fold lines 50c and 52c, with the inside
25 surface of wall 20 abutting with the inside surfaces of
portions 50a and 52a and the inside surface of wall 22
abutting with the inside surfaces of portions 50b and 52b
and with peripheries 20a, 22a, 50ad, 50bd, 52ad, and 52bd
aligned. First, interconnection portion 26a of strip 26
30 is suitably activated to interconnect walls 20 and 22
together intermediate fold lines 50c and 50d adjacent
peripheries 20a and 22a aside from second, interconnection
portion 26b, to interconnect wall 20 to portions 50a and
52a adjacent peripheries 20a, 50ad and 52ad and to
35 interconnect wall 22 to portions 50b and 52b adjacent
peripheries 22a, 50bd and 52bd. After activation of
first, interconnection portion 26a, bag 18 according to

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1 the teachings of the present invention can be folded,
filled, sealed, folded, and overwrapped in generally the
manner as set forth in Figures 3-7.

It should be appreciated that bag 18, including bag 18
5 having gusseted side panels 50 and 52, can be
manufactured in other manners according to the teachings
of the present invention. As an example, a single
rollstock of microwave bag material could be provided with
susceptor patch 30 (if desired) and adhesive strip 26
10 printed in the appropriate locations. The edges of the
rollstock could be folded inward and lap or fin sealed to
form a tube, and if desired, the gussets could be folded
inward. The tube would then be heat-sealed and die-cut
into the appropriate round-like shape. The preferred
15 location of the lap or fin seal on the tube could be
opposite to susceptor patch 30 when forming bag 18 of
Figures 1-6, 8, and 9 as well as at other locations
including along fold line 50c or 52c of gusseted side
panel 50 or 52. Similarly, each component of bag 18 could
20 be formed from separate rollstocks and cut to shape
either before or after activation of adhesive strip 26.
Likewise, although two panel portions 50a, 50b, 52a, and
52b are provided in each of the gusseted side panels 50
and 52 in the preferred form shown, it can be appreciated
25 that gusseted side panels 50 and 52 can include
additional panel portions having the same or differing
widths.

In the preferred form shown in Figures 13-16, outer
peripheries 20a and 22a of walls 20 and 22 have round-like
30 shapes in the form of an oval. In the most preferred
form, peripheries 20a and 22a of walls 20 and 22 and
peripheries 50ad, 50bd, 52ad, and 52bd of side panels 50
and 52 include peripheral extensions 54 which extend
beyond the round-like shape of peripheries 20a and 22a and
35 adhesive strip 26 adjacent the opposite ends of second,
interconnection portion 26b.

Bag 18 shown in Figures 13-16 according to the

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1 preferred teachings of the present invention is similarly
advantageous as previously set forth as well is
advantageous for other reasons. Specifically, during the
popping of the popcorn kernels and the expansion of bag
5 18, gusseted side panels 50 and 52 will unfold along fold
lines 50c and 52c so that panel portions 50a and 50b and
panel portions 52a and 52b tend to approach a planar
condition. However, even with the provision of gusseted
side panels 50 and 52, walls 20 and 22 as the result of
10 the expansion of bag 18 expand into a bowl, hemispheric
or parabolic curve shape from their peripheries 20a and
22a. Thus, the advantages of the bowl, hemisphere, or
parabolic curve shape of inflated bag 18 are obtained
according to the preferred teachings of the present
15 invention. In this regard, due to the oval shape of
peripheries 20a and 22a in a flat condition and the
expansion of gusseted side panels 50 and 52, bag 18 of
Figures 13-16 tends to have a circular shape in an
expanded condition when viewed from the top looking down.
20 In the preferred form, the peelable closure is formed
in the interconnection between walls 20 and 22 and
intermediate gusseted side panels 50 and 52, and bag 18 is
opened utilizing a cross pinch-pull technique similar to
conventional rectangular microwave popcorn bags. In
25 particular, portion 26b is formed as a peelable closure
which fails during microwave cooking to provide venting and
to allow ease of separation when desired to open bag 18.
In particular, the corners defined generally at the
interconnection of wall 20 and panel portion 50a (and in
30 the most preferred form at the peripheral extensions 54
thereof) is pinched between the thumb and forefinger of
one of the consumer's hands and the corner defined
generally at the interconnection of wall 22 and panel
portion 52b (and in the most preferred form at peripheral
35 extensions 54 thereof) is pinched between the thumb and
forefinger of the other of the consumer's hands and the
corners are pulled apart to release adhesive strip 26

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1 between wall 20 and panel portion 52a, between wall 22 and
panel portion 50b and between walls 20 and 22. Then, bag
18 is grasped at the opposite corners defined generally at
the interconnection of wall 20 and panel portion 52a and
5 at the interconnection of wall 22 and panel portion 50b
(and in the most preferred form at peripheral extensions
54 thereof) and the corners pulled apart to release
adhesive strip 26 between wall 20 and panel portion 50a,
between wall 22 and panel portion 52b, and between walls
10 20 and 22. Adhesive strip 26 can be opened as little or
as much as the consumer chooses ie a narrow opening
facilitates pouring into a bowl whereas a wide opening
facilitates easy eating directly out of bag 18. As
consumers are accustomed to utilizing cross pinch-pull
15 techniques in opening conventional rectangular popcorn
bags, increased consumer acceptance may be experienced
with bag 18 of Figures 13-16 than with bags 18 which do
not utilize cross pinch-pull techniques. Also, when the
peelable closure is formed in the interconnection between
20 walls 20 and 22 as in Figures 13-16 as well as in Figure
12, top wall 22 can be formed from a single integral
component according to the teachings of the present
invention and specifically without the added expense of
fabrication from multiple pieces required for fin seal 28
25 of Figures 1, 8 and 9, the layered portions 22d and 22e of
Figures 10 and 11 or of fabrication with other manners of
peelable closures.

Although openable along peripheries 20a and 22a, bag 18
of Figures 13-16 according to the teachings of the present
30 invention also provides a serving bowl function but in a
different manner than bags 18 shown in Figures 1, 8, 9,
11 and 12. In particular, when inflated with popped
popcorn, walls 20 and 22 intermediate fold lines 50c and
52c extend at a relatively large diameter arc generally
35 perpendicular to adhesive strip 26. Similarly, portions
50a and 50b and portions 52a and 52b which are unfolded
relative to each other extend at a relatively large

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1 diameter arc generally parallel to adhesive strip 26
intermediate fold lines 50c and 52c. Thus, a relatively
flat support surface is defined thereby which can be
placed on a table, counter, or the like to hold bag 18
5 with walls 20 and 22 extending generally vertically and in
a stable, non-tipping manner.

Additionally, in the preferred form, the serving bowl
function of bag 18 of Figures 13-16 can be further
enhanced by folding walls 20 and/or 22 and/or side panels
10 50 and/or 52 about a fold line above the volume of popped
popcorn so that the inside surfaces thereof abut in a
manner as shown in Figure 15. In this regard, adhesive
strip 26 between side panels 50 and 52 and walls 20 and 22
can be separated by the consumer to an extent generally
15 equal to the level of the popped popcorn. When so folded,
the hand of the consumer would be less prone to rubbing
against residual oil or grease on the inside surfaces of
bag 18 while removing popcorn from bag 18 as the outer
surface of side panels 50 and 52 and walls 20 and 22 would
20 be what would be inadvertently touched. It should then be
appreciated that the peripheral interconnection of walls
20 and 22 and of walls 20 and 22 and side panels 50 and 52
is especially advantageous in providing this enhanced
serving bowl function without requiring tearing of bag 18.

25 Extensions 42 and 54 provide multiple functions
according to the preferred teachings of the present
invention. First, extensions 54 extend from the inflated
bag 18 in a generally radial fashion, with both extensions
42 and 54 creating a visual indication where bag 18 should
30 be opened as extensions 42 and 54 have the appearance as
handle tabs. Second, extensions 42 and 54 provide
increased area for grasping and gripping by the consumer.
Also, as extensions 54 are located outwardly of adhesive
strip 26 and the interior of bag 18, extensions 54 do not
35 have the tendency to be hot to the touch as other portions
of bag 18 which have direct contact with the popped
popcorn. Thus, extensions 54 provide increased consumer

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1 safety from contacting hot surfaces. Similar consumer
safety is also provided by extension 42. It should be
appreciated that due to the round-like shape of periphery
22g of portion 22e of wall 22 and of peripheries 20a and
5 22a of walls 20 and 22 and the arcuate shape of
peripheries 50ad, 50bd, 52ad, and 52bd and since walls 20
and 22 and side panels 50 and 52 are typically cut from
continuous rollstock, extensions 42 and 54 according to
the teachings of the present invention are formed from
10 otherwise unused and discarded portions of the rollstock
so that no additional cost is encountered in providing
extensions 42 and 54.

Extensions 42 and 54 would have similar application to
bags 18 according to the preferred teachings of the
15 present invention which do not include gusseted side
panels 50 and 52. As an example, where it is desired to
provide a peelable closure between peripheries 20a and 22a
of walls 20 and 22 such as to allow pouring of the popped
popcorn therethrough, extensions 54 could be formed on
20 peripheries 20a and 22a for separating adhesive strip 26
therebetween. In such applications, extensions 54 could
be formed as a continuous piece centered on the desired
peelable closure. Likewise, extensions 56 could be formed
on the edges of portions 22b and 26c at fin seal 28 such
25 as shown in Figure 17 for grasping by the consumer in
pulling the opposite sides of seal 28 when fin seal 28
provides the peelable closure.

Additionally, although the particular manner of
manufacture, filling, and folding of bag 18 is believed to
30 be advantageous including but limited to having a final
conventional, rectangular shape for secondary packaging
purposes, bag 18 can be manufactured, filled and/or folded
in other manners according to the teachings of the present
invention. In this regard, it may be desirable to fold or
35 otherwise configure bag 18 to have a final shape which is
different than other conventional shapes to emphasize the
uniqueness of bag 18 in the marketing thereof.

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CLAIMS

1. Expandable microwave package for holding a food product for popping or puffing in a microwave oven comprising, in combination: a bag including a bottom wall and a top wall, with the bottom and top walls each formed of a sheet of non-extendable flexible material, with the bottom wall having an outer periphery of a substantially round shape, with the top wall having an outer periphery of a substantially round shape corresponding to the outer periphery of the bottom wall, with the bottom and top walls being interconnected together adjacent to the outer peripheries, with the top and bottom walls expanding into an opposing double domed shape when the food product is popped or puffed in the microwave oven, with the interconnected outer peripheries puckering as the top and bottom walls expand into the opposing double domed shape.

2. The expandable microwave package of claim 1 wherein the bag further includes a first gussetted side panel and a second gussetted side panel, with the first and second gussetted side panels each being formed of a sheet of flexible material, with the gussetted side panels each being formed of at least first and second panel portions which overlies each other and which include outer peripheries corresponding to the outer peripheries of the bottom and top walls, with the bottom and top walls being interconnected together by their interconnection to the first and second gussetted side panels adjacent to the outer peripheries, with the bottom wall being interconnected to the first panel portions of the first and second gussetted side panels and with the top wall being interconnected to the second panel portions of the first and second gussetted side panels, with the top and bottom walls expanding into an opposing double domed shape as the food product is being popped or puffed in the microwave oven.

3. The expandable microwave package of claim 1 wherein the bottom and top walls are directly interconnected

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together adjacent to the outer peripheries.

4. The expandable microwave package of any proceeding claim wherein the bag further includes a peelable closure which fails during microwave cooking allowing trapped steam to vent and allowing the bag to be opened to provide access to the popped or puffed food product.

5. The expandable microwave package of claim 4 wherein the peelable closure is formed in the top wall.

6. The expandable microwave package of claim 5 wherein the top wall includes first and second wall portions and a seal between the first and second wall portions, with the seal between the first and second wall portions forming the peelable closure.

7. The expandable microwave package of claim 6 further comprising, in combination: first and second extensions formed on the bag, with the first and second extensions formed on the first and second wall portions and outward of the seal between the first and second wall portions.

8. The expandable microwave package of claim 6 or 7 wherein the seal extends between two points on the outer periphery of the top wall.

9. The expandable microwave package of claim 8 wherein the seal extends along a diameter of the shape of the outer periphery of the top wall.

10. The expandable microwave package of claim 4 further comprising, in combination: at least a first extension formed on the bag adjacent the peelable closure and outward of the peelable closure.

11. The expandable microwave package of claim 10 wherein the peelable closure is formed in the interconnection between the bottom and top walls.

12. The expandable microwave package of claim 11 further comprising, in combination: a second extension formed on the bag with the first and second extensions

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formed on the outer peripheries of the top and bottom walls and outward of the interconnection.

13. The expandable microwave package of claim 12 wherein the extensions are located on the outer peripheries on opposite sides of the peelable closure.

14. The expandable microwave package of claim 10 wherein the top wall has an access opening, with the bag further including a closure portion having an outer periphery of a size greater than the access opening, with the bag including a seal between the closure portion and the top wall around the access opening, with the extension formed on the outer periphery of the closure portion.

15. The expandable microwave package of claim 14 wherein the access opening and the outer periphery of the closure portion are generally circular in shape.

16. The expandable microwave package of claim 14 or 15 wherein the outer periphery of the top wall is of a size larger than the access opening; and wherein the extension is of a size located within the outer periphery of the top wall.

17. The expandable microwave package of claim 2 wherein the bag further includes a peelable closure which fails during microwave cooking allowing trapped steam to vent and allowing the bag to be opened to provide access to the popped or puffed food product; and wherein the peelable closure is formed intermediate the first and second gusseted side panels.

18. The expandable microwave package of claim 1 wherein the bottom and top walls are interconnected together adjacent to the outer peripheries by a first interconnection portion and a second interconnection portion, with the first interconnection portion extending a substantial portion of the outer peripheries, with the first interconnection portion interconnecting the outer peripheries prior to and after the introduction of the popcorn kernels into the bag,

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with the second interconnection portion allowing separation of the outer peripheries in the second interconnection portion for the introduction of the food product in the bag and interconnecting the outer peripheries in the second interconnection portion after the introduction of the food product into the bag.

19. The expandable microwave package of claim 18 wherein the first and second interconnection portions interconnect the outer peripheries in a sealing manner which does not vent during microwave cooking.

20. The expandable microwave package of claim 18 or 19 wherein the bag further includes first and second fold lines extending from first and second points on opposite sides of the second interconnection portion, with the first and second fold lines dividing the bag into a central portion and first and second wings, with the first and second wings overlaying the central portion.

21. The expandable microwave package of claim 20 wherein the first and second fold lines are in a spaced parallel relation.

22. The expandable microwave package of claim 21 wherein the radial distance between the first and second fold lines is generally equal to one half of a diameter of the shapes of the outer peripheries, with the first and second fold lines located on opposite sides of the diameter of the shapes of the outer peripheries and equidistant therefrom.

23. The expandable microwave package of claim 21 or 22 wherein the bag further includes a third fold line extending between the first and second fold lines when the first and second wings overlay the central portion, with the third fold line defining a third wing overlaying the first and second wings.

24. The expandable microwave package of claim 23 wherein the third fold line extends generally perpendicular

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between the first and second fold lines, with the radial distance between the outer peripheries and the third fold line is generally equal to one third of the diameter of the shapes of the outer peripheries, with the second interconnection portion being opposite to the third wing.

25. The expandable microwave package of claim 23 or 24 wherein the bag includes a fourth fold line extending between the first and second fold lines when the first and second wings overlay the central portion, with the fourth fold line defining a fourth wing overlaying the third wing.

26. The expandable microwave package of claim 25 wherein the fourth fold line extends generally parallel to the third fold line, with the radial distance between the outer peripheries and the fourth line being generally equal to one third of the diameter of the shapes of the outer peripheries.

27. The expandable microwave package of any proceeding claim further comprising, in combination: a susceptor patch extending over the bottom wall.

28. The expandable microwave package of claim 25 or 26 further comprising, in combination: a susceptor patch extending over the bottom wall and generally between the first, second, third, and fourth fold lines.

29. The expandable microwave package of claim 4 wherein the peelable closure is a portion of the peripheral interconnection.

30. The expandable microwave package of claim 29 further comprising, in combination: at least one top extension formed on the outer periphery of the top wall; and at least one bottom extension formed on the outer periphery of the bottom wall, with the extensions formed adjacent the peelable closure and outward of the peripheral interconnection.

31. The expandable microwave package of claim 30 wherein first and second top extensions are formed on the

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outer periphery of the top wall spaced from each other and adjacent the opposite ends of the peelable closure; and wherein first and second bottom extensions are formed on the outer periphery of the bottom wall spaced from each other and adjacent the opposite ends of the peelable closure.

32. The expandable microwave package of any proceeding claim wherein the sheets of flexible material are paper.

33. The expandable microwave package of any proceeding claim wherein the package holds food product in the form of popcorn kernels.

34. The expandable microwave package of any proceeding claim wherein the domed shape of the bottom wall is of a parabolic curve shape to keep the unpopped or unpuffed food product huddled closer together.

35. The expandable microwave package of any claim 1-33 wherein the domed shape of the bottom wall is of a parabolic curve shape to enhance the ability of the bag to rock in any direction from the force of the popping or puffing food product hitting against the bag to maximize gravimetric separation of the unpopped or unpuffed food product to the bottom of the popped or puffed food product.

36. The expandable microwave package of any proceeding claim wherein the outer peripheries are circular in shape.

37. The expandable microwave package of any proceeding claim 1-35 wherein the outer peripheries of the top and bottom walls in a flat condition are oval in shape.

38. Expandable microwave package for holding a food product for popping or puffing in a microwave oven comprising, in combination: a bag having an interior for holding a charge of food product to be subjected to microwave energy and having a top wall including an access opening, with the bag further including a closure portion having an outer periphery of a size greater than the access opening, with the bag including a seal between the closure portion and the top wall around the access opening, with the

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bag expanding into an expanded condition.

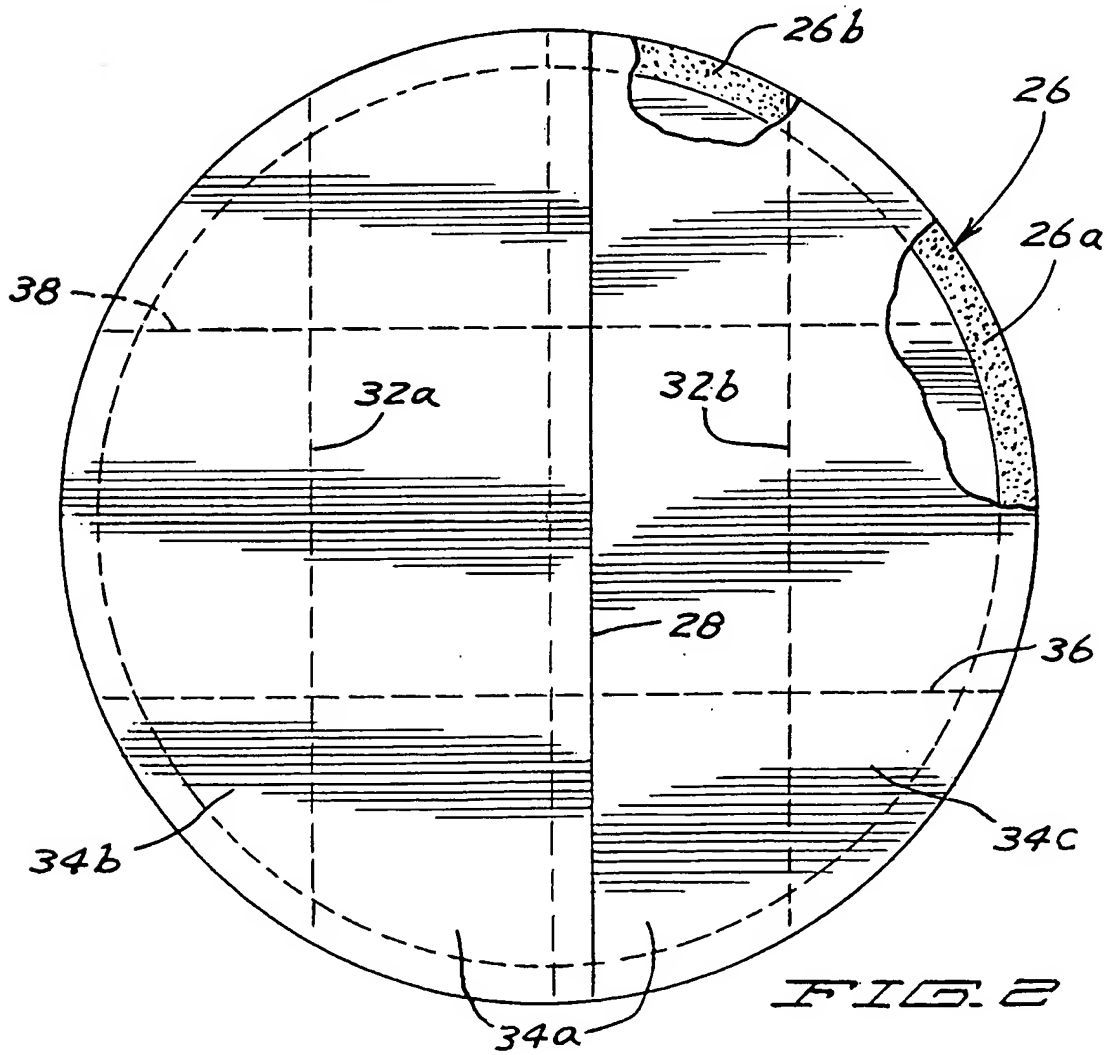
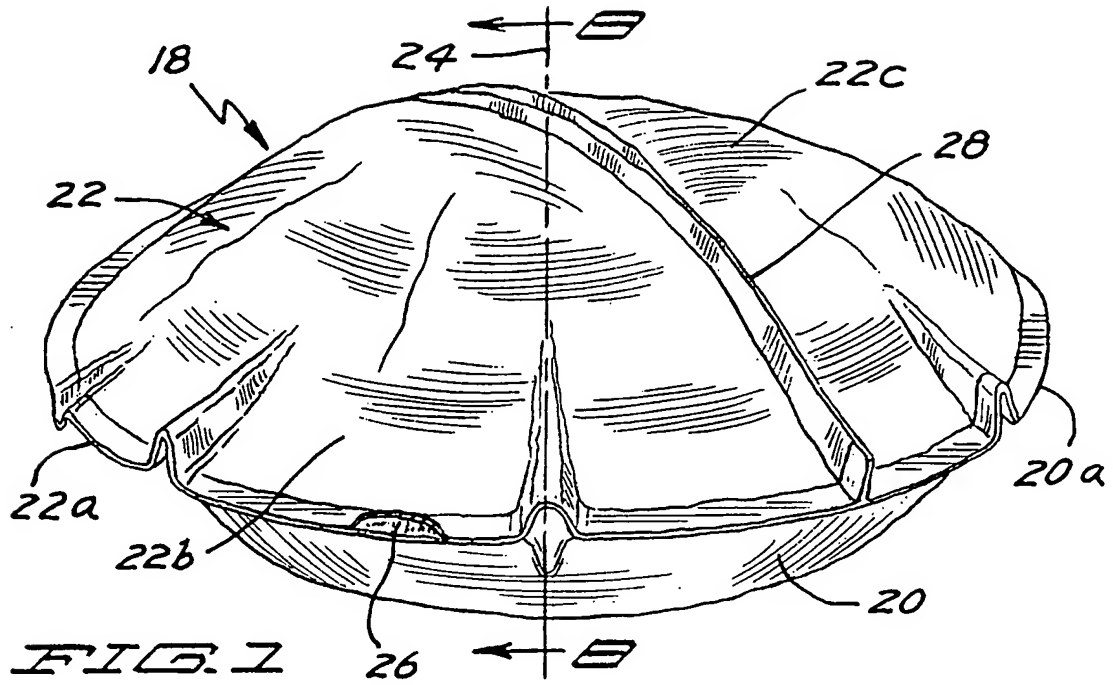
39. The expandable microwave package of claim 38 wherein the access opening and the outer periphery of the closure portion are generally circular in shape.

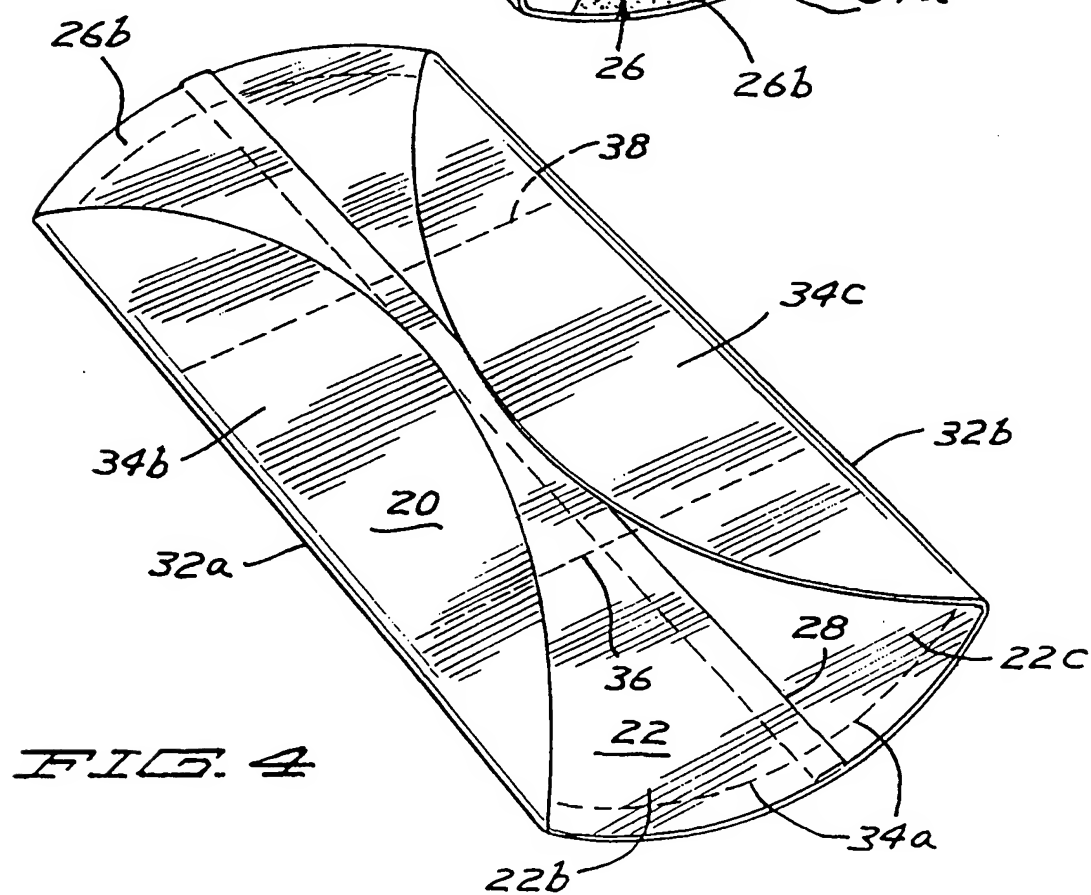
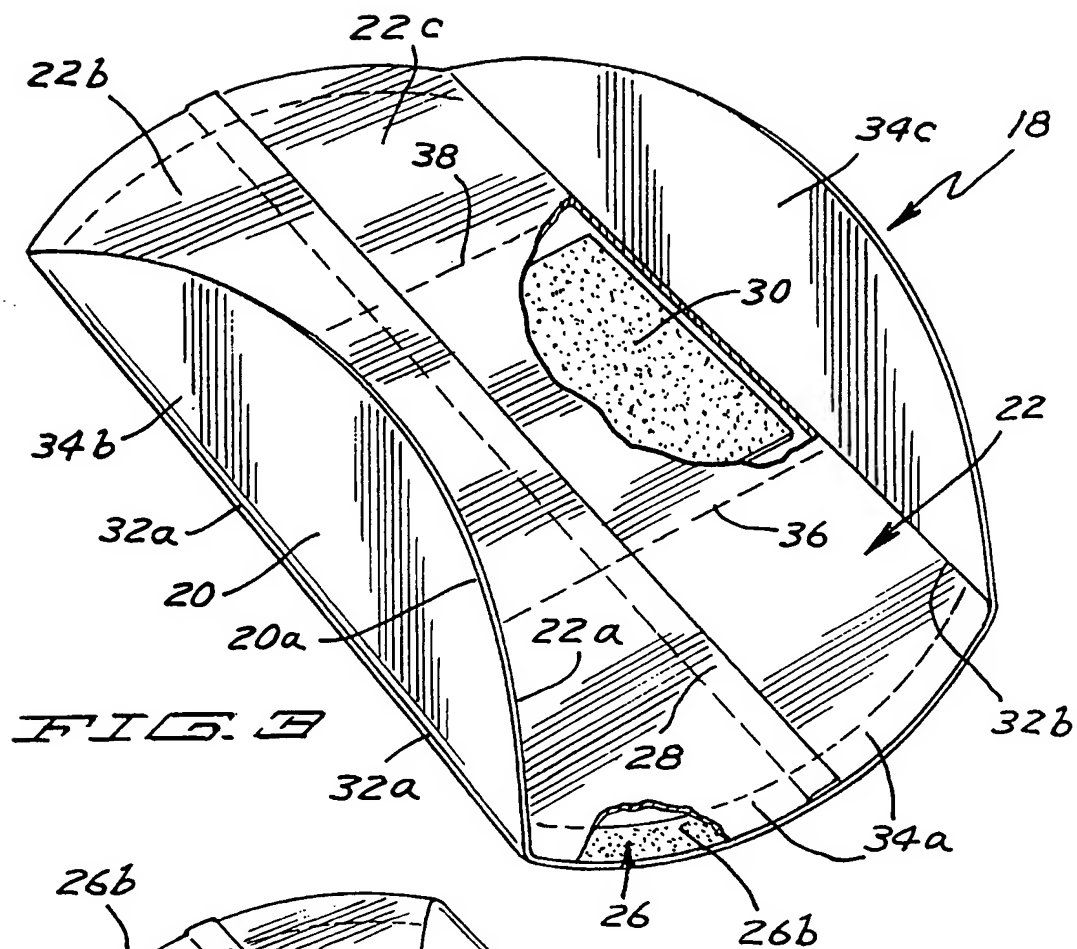
40. The expandable microwave package of claim 38 or 39 further comprising, in combination: an extension formed on the outer periphery of the closure portion outward of the seal.

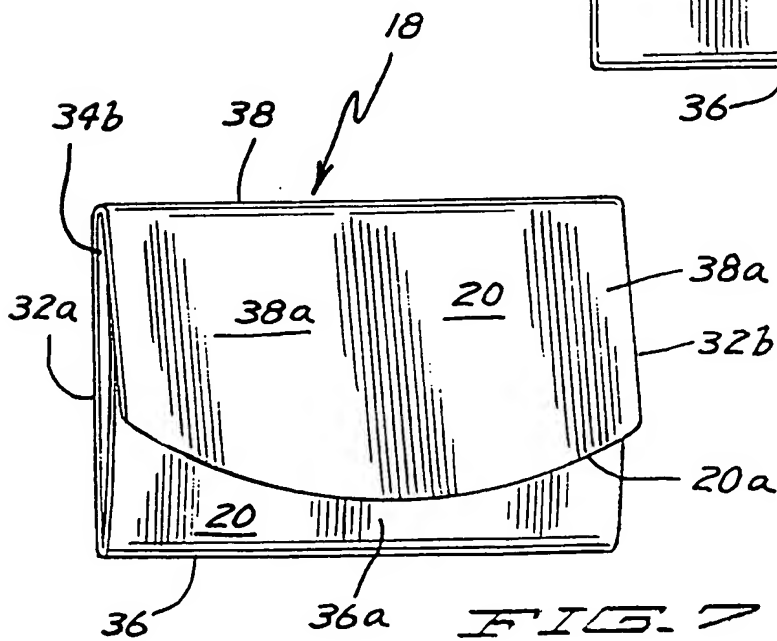
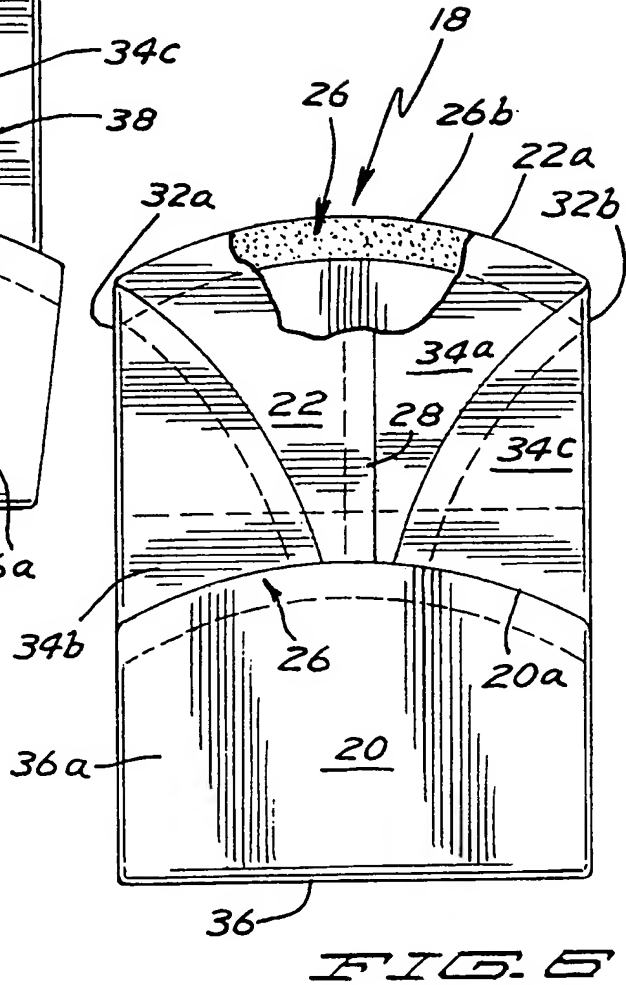
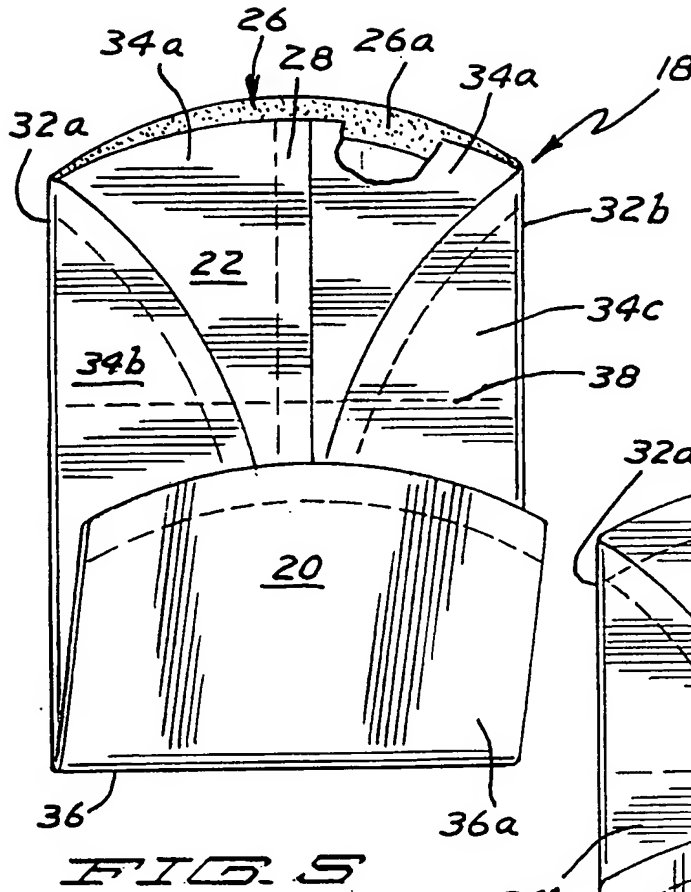
41. The expandable microwave package of claim 40 wherein the top wall includes an outer periphery of a size larger than the access opening; and wherein the extension is of a size located within the outer periphery of the top wall.

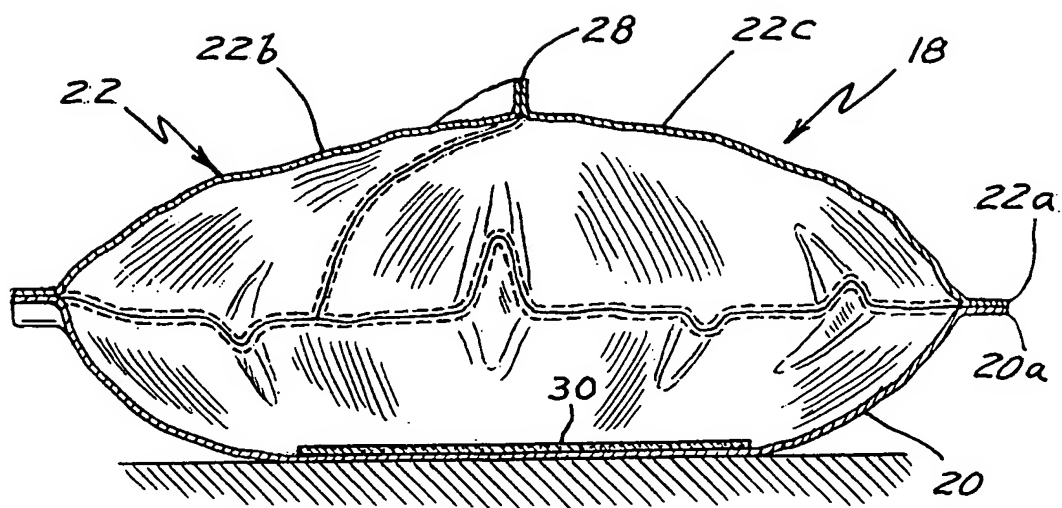
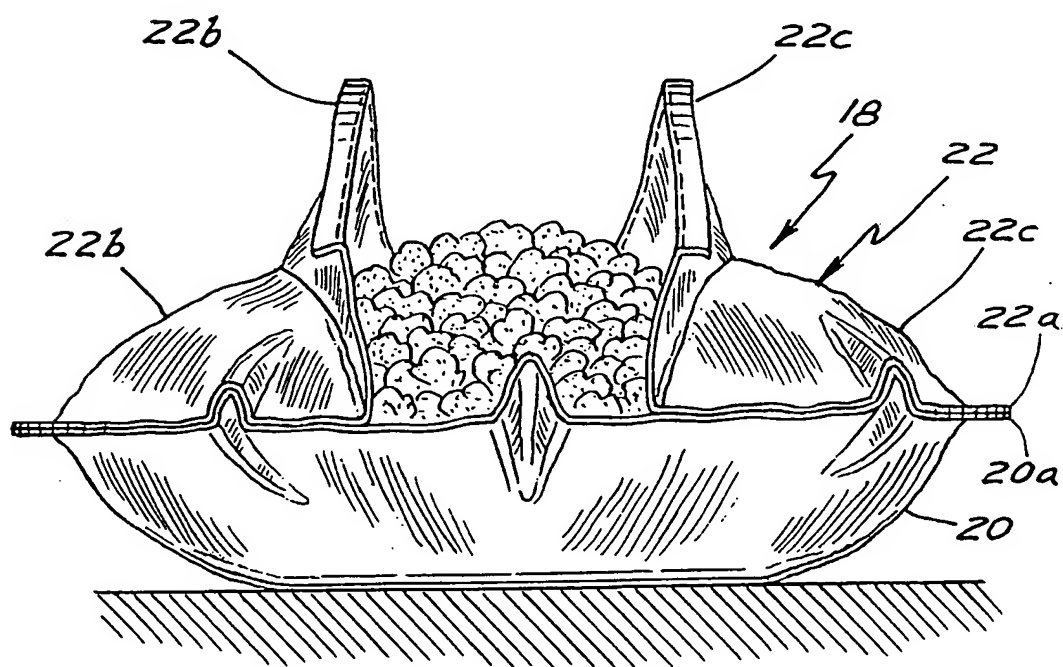
42. The expandable microwave package of claim 41 wherein the outer periphery of the top wall has a substantially round shape.

43. The expandable microwave package of any claim 38-42 wherein the seal includes a peelable closure portion which fails during microwave cooking allowing trapped steam to vent and allowing the bag to be opened to provide access to the popped or puffed food product through the access opening.







*FIG. 8**FIG. 9*

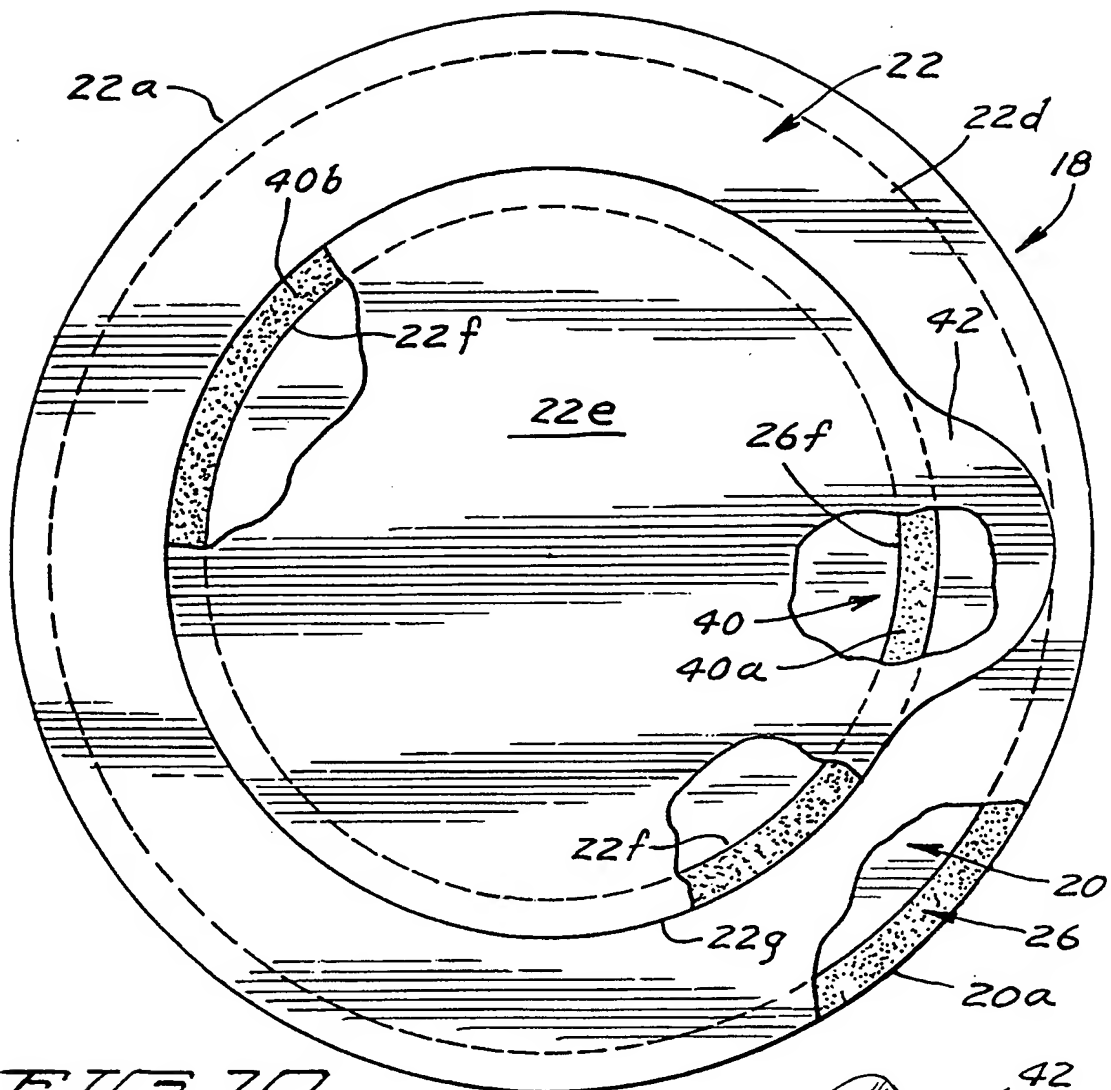


FIG. 10

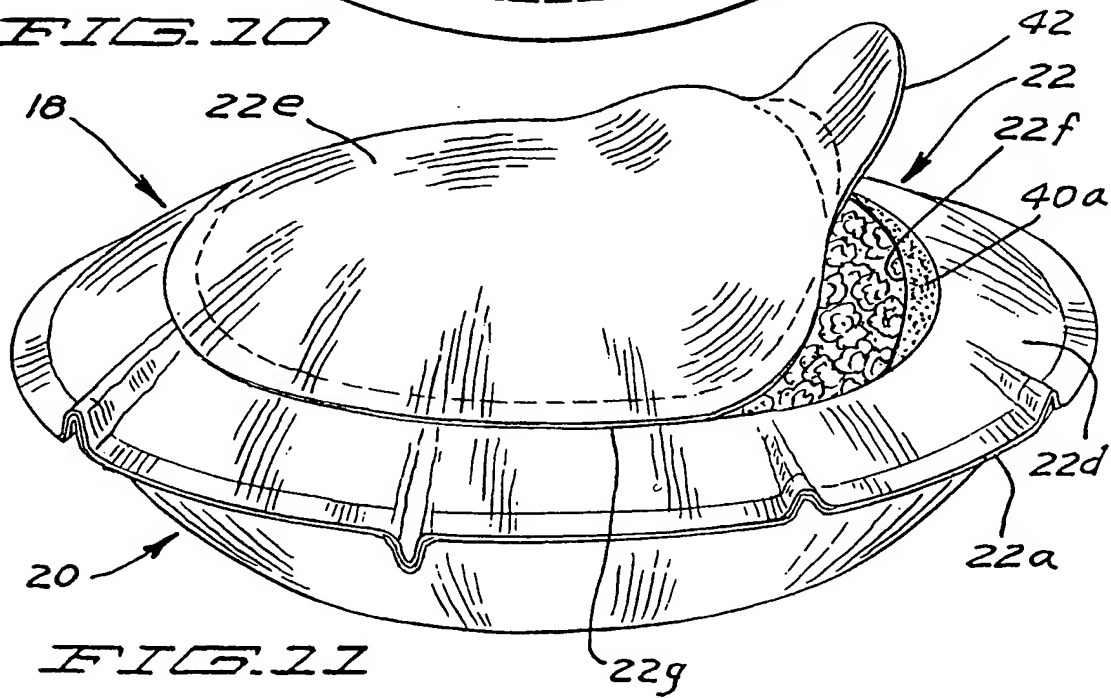
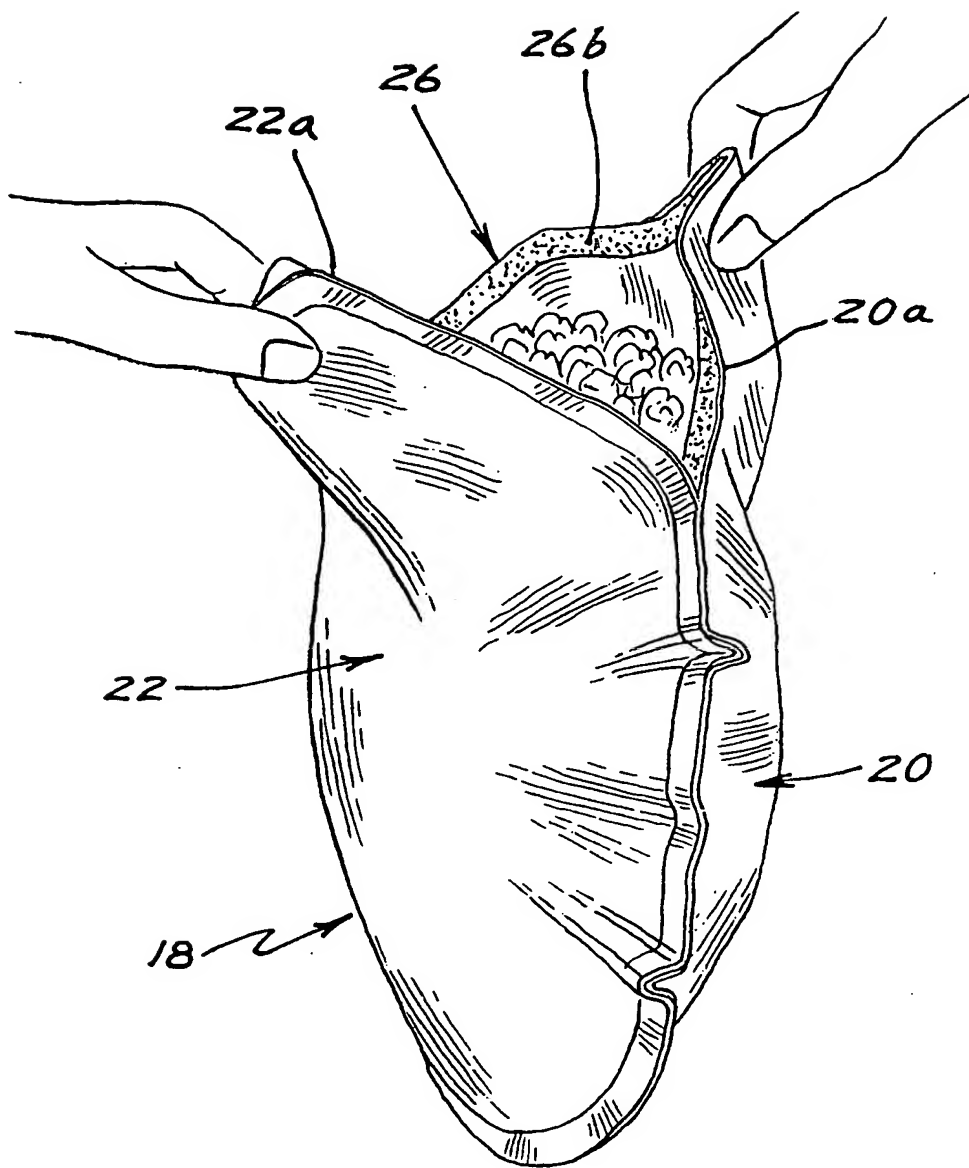
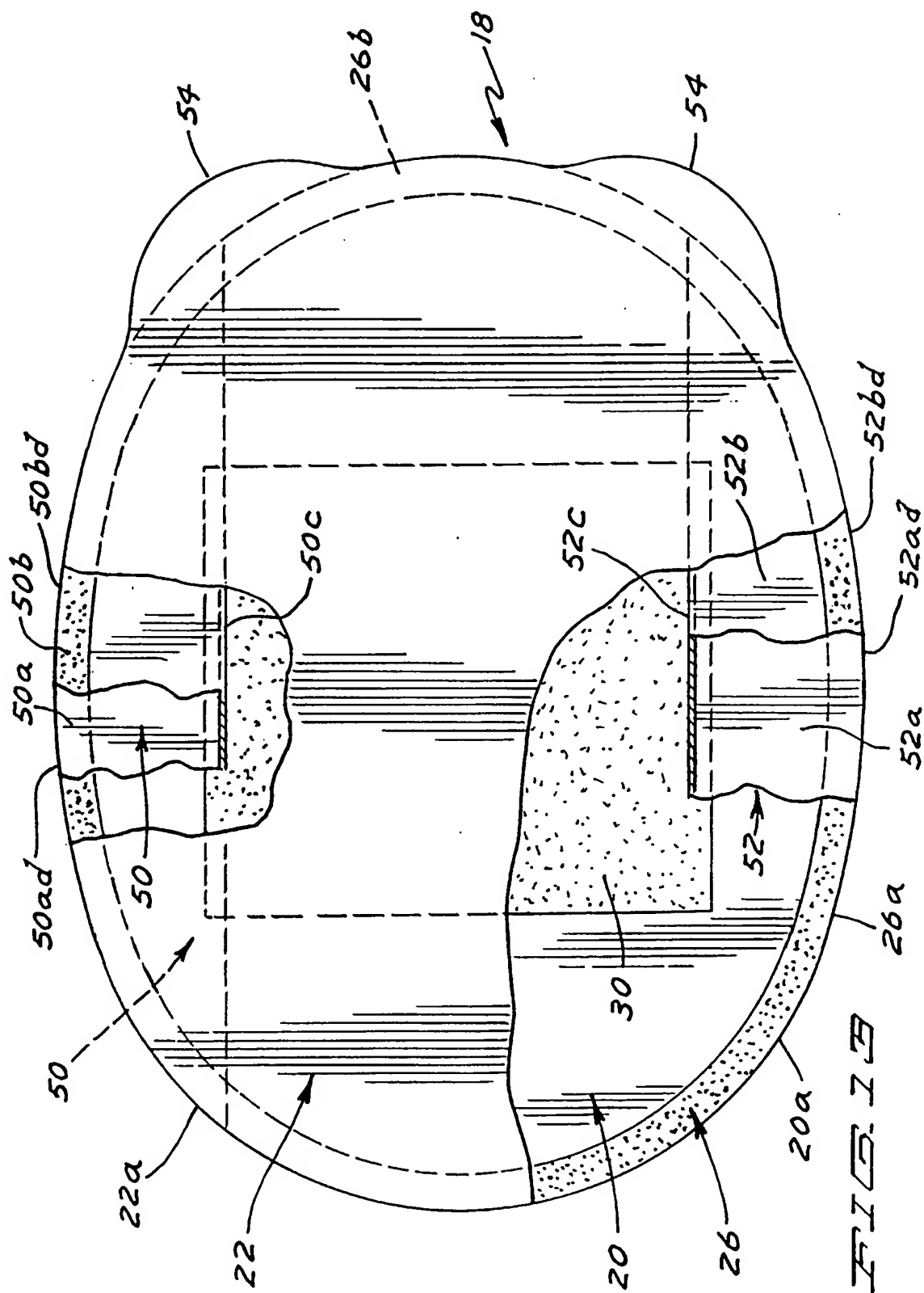
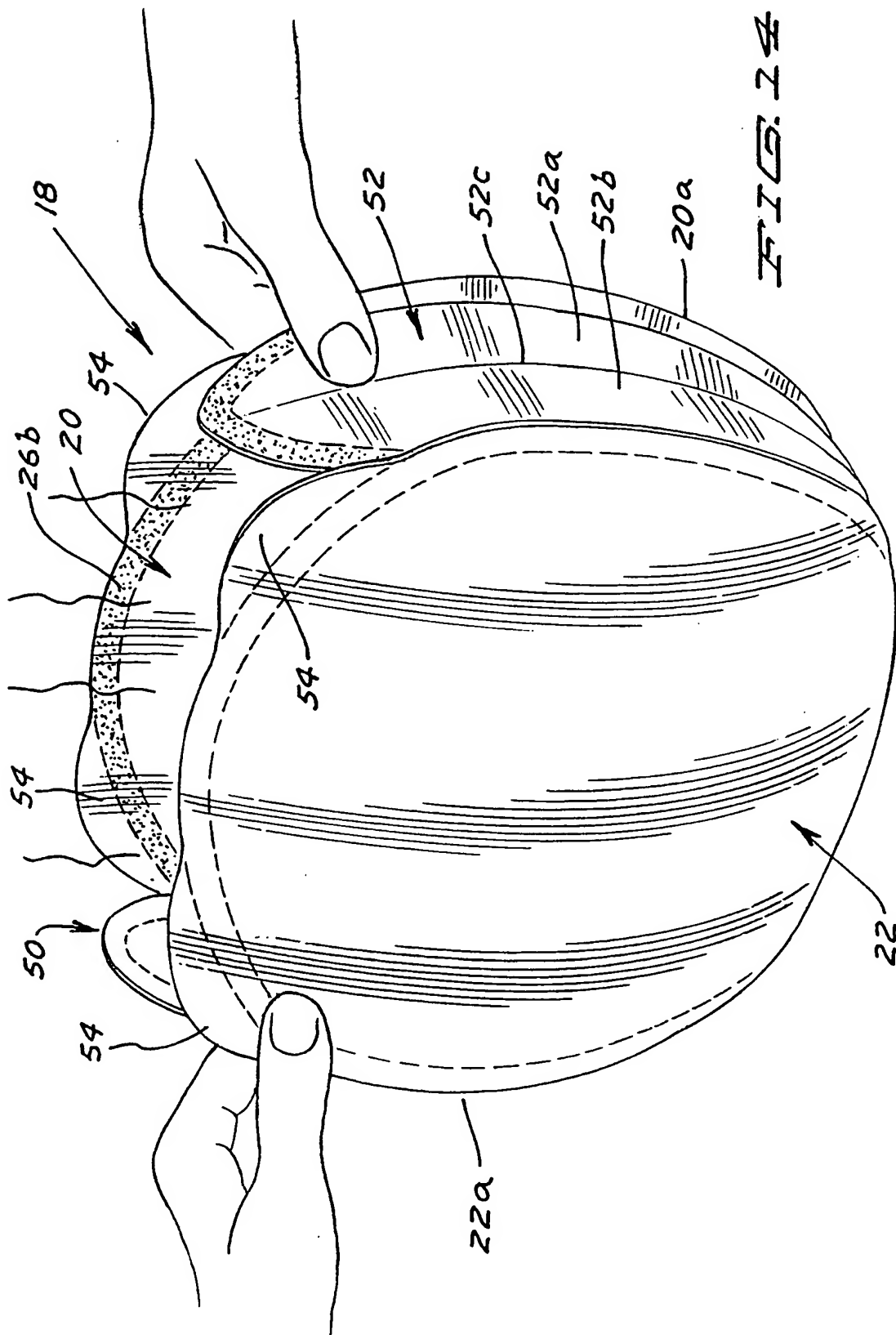


FIG. 11

*FIG. 12*





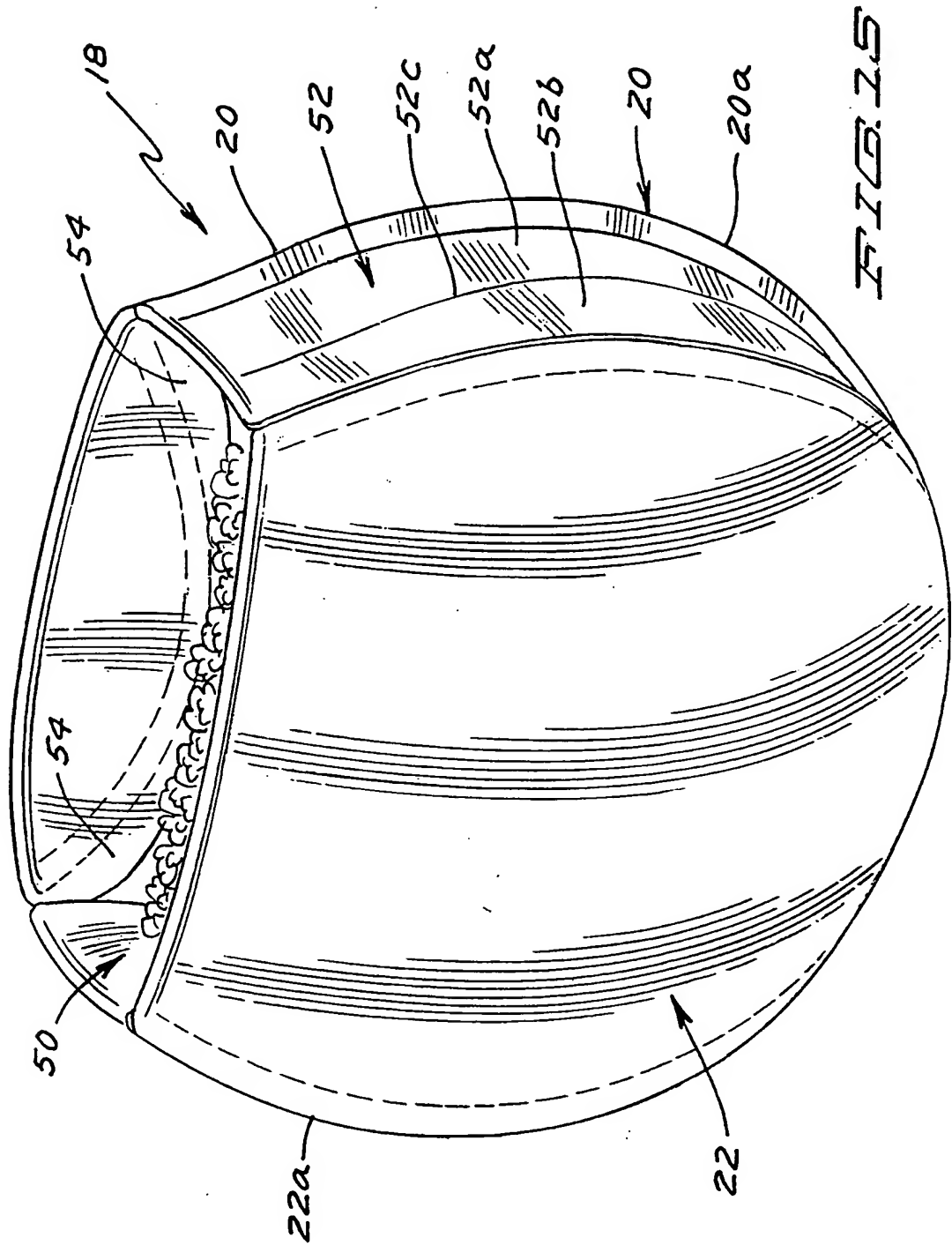


FIG. 15

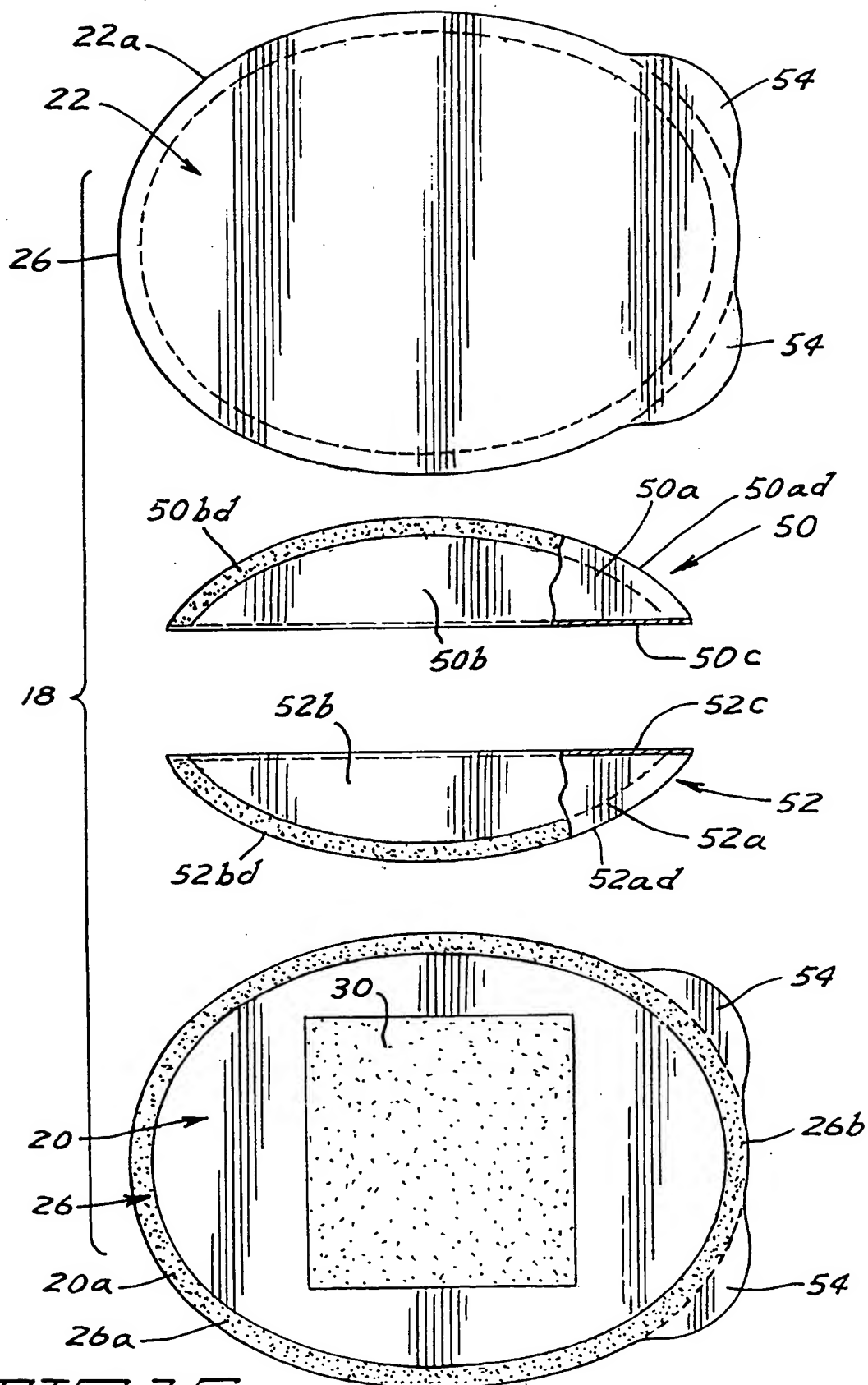


FIG. 16

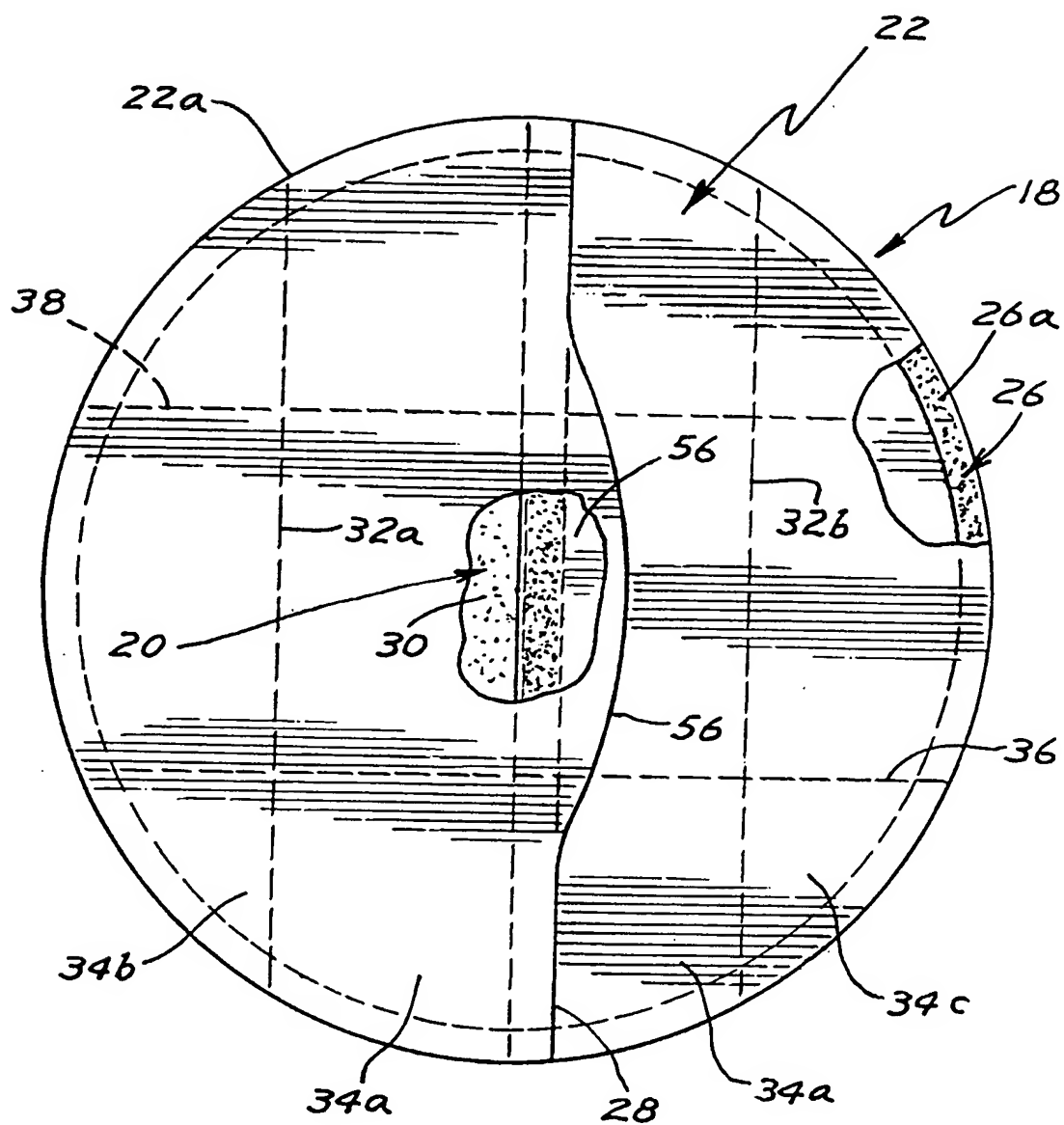


FIG. 17

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 98/21912

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 B65D81/34 B65D75/28

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 B65D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 734 288 A (FINCHAM DOUGLAS M ET AL) 29 March 1988	1,3,4, 33-37
Y	see column 6, line 44 - column 8, line 14; figures 2,3	5,6,8,9, 18,27, 28,32
Y	EP 0 294 087 A (NABISCO BRANDS INC) 7 December 1988	5,6,8,9, 27,28,32
A	see page 8, line 38 - page 9, line 6; figures 10-12	2,20-26
Y	PATENT ABSTRACTS OF JAPAN vol. 16, no. 99 (M-1220), 11 March 1992 & JP 03 275474 A (YOSHIYUKI KIKAKU KK), 6 December 1991	18
X	see abstract	38,39

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

3 March 1999

Date of mailing of the international search report

16/03/1999

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INTERNATIONAL SEARCH REPORT

Int. Patent Application No

PCT/US 98/21912

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 171 950 A (BRAUNER ARNE H ET AL) 15 December 1992 see the whole document ---	1,18-26
A	US 5 473 142 A (MASS LAWRENCE) 5 December 1995 see the whole document ---	1-37
A	US 4 911 938 A (SIMON FREDERICK E ET AL) 27 March 1990 see the whole document ---	1-37
A	US 4 453 665 A (SCOTT RAYMOND G ET AL) 12 June 1984 see the whole document ---	1-37
A	GB 2 096 576 A (FOCKE & CO) 20 October 1982 see page 2, line 86 - line 105; figure 7 -----	1,2,17

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 98/21912

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4734288 A	29-03-1988	JP 61203380 A	09-09-1986
EP 0294087 A	07-12-1988	AU 1739188 A	08-12-1988
		DK 304988 A	06-12-1988
		JP 63317464 A	26-12-1988
US 5171950 A	15-12-1992	NONE	
US 5473142 A	05-12-1995	US 5294764 A	15-03-1994
US 4911938 A	27-03-1990	AT 111415 T	15-09-1994
		AU 633837 B	11-02-1993
		AU 4034089 A	23-03-1990
		CA 1328300 A	05-04-1994
		DE 68918281 D	20-10-1994
		DE 68918281 T	02-03-1995
		EP 0429488 A	05-06-1991
		JP 4506650 T	19-11-1992
		KR 9411849 B	27-12-1994
		MX 167108 B	04-03-1993
		WO 9002087 A	08-03-1990
US 4453665 A	12-06-1984	NONE	
GB 2096576 A	20-10-1982	DE 3115179 A	04-11-1982